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OBSERVATIONS OF BIO–DYNAMIC AND MINERAL TREATMENT OF SOIL

(*The Experimental Garden in* 1951)

EHRENFRIED E. PFEIFFER

Work with an experimental plot was begun in order to compare long term soil changes after treatment with bio-dynamic manure and compost, with soil changes effected by mineral fertilizing. We were especially interested to find out whether the different soil treatments influence crops in regard to health of stand and vitamin content. The experiment is now in its fifth year.*

The BD (bio-dynamically treated) section was fertilized in April with a mixture of well-fermented compost (3 parts) and manure (1 part). The amount was carefully calculated in order to apply approximately equal gifts of nitrogen and phosphate in both cases. The M (minerally fertilized) section was treated on the same date with a 6-10-4 fertilizer at the rate of 500 lbs/acre. The corn and tomatoes in both sections later received a side dressing of the same amounts. The preparation of the seed beds and the sowing were again somewhat delayed by continued rains. However, it was possible to start things earlier this year than in 1950.

A winter cover of rye in both sections was spaded under in mid April, the earliest possible date. One interesting observation could be made in April still. Both the beets and carrots on the M side had to be reseeded because they had germinated poorly and were also washed away by the rains. The seeds in the BD section were not washed away. The corn, tomatoes and beans were hilled and the common practices of weeding, thinning, and hand cultivation were carried out. All seeding of BD and M crops was done at the same time in all cases. The cultivation of both sections was also done on the same date. On June 10th it was observed that the BD beets and carrots were far ahead of the M beets and carrots (even when taking into account the reseeding that had been necessary). The carrot plants in the BD section were 4 to 5 inches high as against the 2½ to 3 inch height of the M carrots.

The differences in soil structure were very evident at all times. The M side washed badly, the BD side not at all. When the rains stopped the M soil crusted, the BD did not. The color

*See previous reports in BIO-DYNAMICS, Vol. VII, Nos. 1 & 5, Vol. IX, No. 3.

of the M soil was light brown, of the BD soil dark, black-brown. A difference in weed growth was also observed. The M section had many, small, stunted weeds; the BD section had a few larger weeds. The following weeds grew in the M plot: carpetweed (Mollugo verticillata), milkweed (Asclepias), smooth pigweed (Chenopodium album), and some Galinsoga (Carduaceae). The only weeds found in the BD section were ragweed (Ambrosia elatior), Galinsoga and chickweed (Alsinaceae).

The bio-dynamic spray preparation No. 500 was applied on April 17th; the other spray No. 501 was applied on June 19th. The yields of corn, beans and tomatoes were good in both cases. The corn in the BD plot produced slightly more. Both beets and carrots suffered from the rains. The peppers presented the most striking contrast. The BD plants grew, flourished well, and produced fine, fat peppers. The M plants were dwarfed, stunted, and produced dwarf peppers. There was almost no trouble with insect pests. No dusting against the Mexican bean beetle was necessary. Nor were any insecticides of any type used in either section.

The interesting part of this experiment is the observation of the changes in pH and organic matter content of the soils and in the vitamin A content of the crops. In spite of annual fluctuations due to the weather, the pattern remains and is clearly visible. This is true as regards the differences between the M and BD groups in general, as well as in the case of the different crops. The following tables tell the story and but little comment is needed. All soil samples were taken and analyzed after the harvest, that is, the findings given represent autumn values.

TABLE 1. *Changes of Acidity, Measured in pH*

CROP AREA	1948	1949	1950	1951
Blank Soil (untreated)	5.0		4.5	5.0
Beans M	6.3	5.0	5.5	4.8
Beans BD	6.4	7.0	7.0	7.0
Corn M	5.8	5.5	5.0	4.5
Corn BD	7.2	7.0	7.5	7.9
Tomatoes M	5.9	5.5	5.0	5.0
Tomatoes BD	6.8	6.0	7.0	7.5
Carrots M	5.9	5.0	5.5	4.5
Carrots BD	6.8	7.0	7.5	6.7
Peppers M	6.1	5.0	5.5	4.8
Peppers BD	6.7	6.5	7.5	7.1

The pH of the entire plot before the beginning of the experiment in 1948 was 5.8.

The organic matter values given in the next table were determined by the La Motte method (oxidation with potassium dichromate in sulphuric acid and titration with ferrous ammonium sulphate).

TABLE 2. *Changes in Organic Matter Content, in Per Cent*

CROP AREA	1948	1949	1950	1951
Blank Soil (untreated)	3.07	2.0	1.05	2.5
Beans M	3.8	2.6	2.6	2.5
Beans BD	5.8	3.6	3.7	2.8
Corn M	3.6	2.5	2.5	3.3
Corn BD	3.55	3.2	3.3	5.0
Tomatoes M	2.6	3.2	2.9	2.6
Tomatoes BD	5.8	4.2	4.0	3.0
Carrots M	4.1	2.5	3.3	2.1
Carrots BD	4.95	3.2	4.3	2.9
Peppers M	3.57	3.4	3.1	2.2
Peppers BD	5.75	4.0	4.1	3.1

In the M as well as in the BD plots the organic matter content was greater than that of the blank soil due to the beneficial influence of the green manure crop of rye during the winter of 1950-51. The blank soil had only 1.8% organic matter in April before the rye was spaded under. The M soil had 2.1%, the BD soil 2.4%, at that time. The increase of organic matter during the summer in the case of the blank soil is also due to its having lain fallow. In the carrot area in the M section no increase was observed in 1951 and in the pepper area only a very slight one. The higher values of 1948 reflect the fact that the plot had been in grasses and clover prior to '48 for several years and a high amount of organic matter had accumulated. Then too, the weather conditions of 1948 were much more favorable than those of 1950 and '51.

TABLE 3. *Changes in Nitrate Content in Pounds Per Acre*
(The La Motte test was used to determine these values)

CROP AREA	1948	1949	1950	1951
Blank Soil (untreated)	5			16
Beans M	100	120	16	6
Beans BD	80	140	32	32
Corn M	120	70	14	16
Corn BD	240	40	28	60
Tomatoes M	105	8	10	2
Tomatoes BD	26	16	15	10
Carrots M	120	80	4	2
Carrots BD	90	24	12	5
Peppers M	80	100	14	2
Peppers BD	420	24	4	20

Nitrate nitrogen is only a fraction of the nitrogen content in soils. There are other forms of nitrogen which are often present; ammonia, nitrite and organic nitrogen. Soil tests of BD treated soils in general show the absence of nitrites and a very low or trace content of ammonia. It was, therefore, of interest to determine the *total* nitrogen content of these soils, since we find no nitrites and ammonia only in traces up to 5 parts per million. The total nitrogen (minus the nitrate content) is represented by organic nitrogen mainly contained in humus and in the microflora as well as the microfauna of the soil. We regret that these tests were not made prior to 1951; however, they will be continued from now on. Here are the figures for the total nitrogen content in pounds per acre. The original analyses were expressed in per cent by weight of the air dry sample. The Kjeldahl method was used to determine the total nitrogen content.

TABLE 3a. *Total Nitrogen in Pounds Per Acre in* 1951

Blank Soil in April	4000	Tomatoes M at harvest time	1120
Blank Soil in October	1620	Tomatoes BD "	3400
Beans M at harvest time	6600*	Carrots M "	2600
Beans BD "	5600*	Carrots BD "	4000
Corn M "	7200	Pepper M "	1000
Corn BD "	9400	Pepper BD "	4200

* Nitrogen fixed in root nodules not included.

It can be gathered from these figures that the nitrate content of a soil is quite different from the *total* nitrogen content. In none of the cases cited would we consider that there was a total nitrogen deficiency. The blank soil, however, shows great nitrogen losses due to exposure. The BD soils have been able to build up nitrogen reserves of varying degrees. Contrary to general belief, the corn acted as the best preserver of nitrogen, while the beans showed quite contradictory results. It must be repeated here, however, that the nitrogen which was stored in the nodules of the bean roots was not determined. As in previous years it was observed that the BD beans produced a much larger number of legume nodules than the M beans. In reply to the critics, it may be stated that it would be quite a task to collect all the nodules produced in a field test for analysis. It should be done, though, in order to complete the picture.*

Bacterial action in soil will release nitrogen for absorption by plant roots, if the *right* kind of bacteria are present. The presence of a well-balanced soil bacterial life in humus is, therefore, of the greatest importance in a) the release of the neces-

* See BIO-DYNAMICS Vol. IX, No. 3: **Compost and Fertilizer on Peas.**

sary amount of nitrogen, and b) the conservation of nitrogen reserves. It has been our observation that bio-dynamically treated composts and proper bacteria cultures, added to soils, will influence the slow and steady release of nitrogen. This matter will be dealt with in another paper in the near future.

The available nitrogen in form of nitrates dropped quite sharply from the 1948 level. At that time, the soil was fallow after a long period of grass cover. Some of the organic reserves had been made available through aeration and cultivation. These were used up or washed out and represent losses. We see, however, that the losses are quite different and the availability changes much more unfavorable in the cases of the mineral corn and tomatoes. The BD corn and beans held much better.

In our experience with BD fields on farms, we have not found such drops in the nitrate contents over the years. In fact, the nitrate content has been held at a very high level, much above average findings. (See BIO-DYNAMICS Vol. IX, No. 1: *Soil Improvements with the Bio-Dynamic Method.*) The explanation can be found in the fact that the manure-compost mixture which was used in the experimental garden had a total nitrogen content of only 0.65%, while in the straight manures (unmixed with compost) as we used them on the fields, the nitrogen content was much higher; and besides, a higher tonnage per acre was applied. Then, too, in field tests on farms at least one to two years of legumes are included in our crop rotation, while no such rest periods were allowed in the experimental garden.

One weak point of many trials with the so-called organic method in the past (by friends as well as enemies) has been that the nitrogen content of manures and composts used was not determined. Now there are great differences between compost and *compost*, and manure and *manure*. We have analyzed hundreds of composts, hand made, farm made, and commercial products. There are as many varieties of compost as there are fertilizer brands and formulas. Composts range from 0.4 to 2.0% total nitrogen. Unless someone knows exactly how much nitrogen his compost contains he may produce failures with compost applications too. Many comparative tests made by opponents report that there was no difference in yield between fertilizer soils and organic soils. Did they take into account the fact that a compost application has to be as scientifically applied to the specific type of soil and crop as a fertilizer application?

There is no doubt, for instance, that a compost without nitrogen fixing bacteria will lose out in nitrogen just as much as a fertilizer will. The organic farmer should learn to work out from a solid, scientific foundation in his practices and then the opponents could learn something from his experience. Up to the present moment, we observe all too frequently that the "mineral" opponent carries out the mineral part of his tests very correctly, but evidences considerable ignorance about the organic part. We do not blame him. How can he know as long as the foundation for the organic science is still in its infancy and as long as even otherwise recognized soil scientists and soil bacteriologists reveal an absence of knowledge and experience in these fields?

One thing is sure: in our laboratory many years have been spent in the study of composts, humus, soil and compost bacteriology, and when this experience has been applied under farm conditions, the farmer has been able to obtain top yields without failures or decline in his soils. The fact remains that on BD farms no nitrogen problem exists. The fact should also be considered that organic nitrogen is two to five times more effective than the same amount of inorganic nitrogen, but only—*if and when* the proper microflora is present in compost and soil; that is, if care has been taken to maintain a high level of nitrogen fixing bacteria and to include legumes in the crop rotation. The writer used to preach the gospel of legumes in the crop rotation twenty years ago and sees with satisfaction that it has now become common knowledge.

How complex the matter is in regard to nitrogen is also recognized by others. We quote from *Fertilizer Recommendations Based on Soil Tests* by O. J. Coleman of the Soil Department of the University of Missouri which appeared in BETTER CROPS WITH PLANT FOOD Vol. XXXV, No. 9, Nov. 1951:

"Unlike mineral nutrients, nitrates are mobile and are carried down into the soil by percolating water. Because of this, nitrates cannot be stored as such in the soil and do not lend themselves so well to measure by soil tests. The amount of this nutrient present in the soil in turn is affected by soil tilth, drainage, aeration, the amount and kind of organic matter, soil texture, etc. Nitrogen, however, is held in the soil in a rather stable form as organic matter or humus. A much better estimate of the nitrogen that will be released during the growing season can, therefore, be made by testing the soil for its percent

of stable organic matter. As this organic matter decomposes, it produces the mobile nitrates which diffuse readily through the soil with the percolating water to the roots, and as a result they are approximately 100% available."

Coleman also mentions that, under favorable conditions in the Missouri area, 5 per cent of the total organic matter consist of nitrogen. With a 2% organic matter content, this would be 2000 lbs. per acre, a figure which we have also found in our total nitrogen analyses of soils.

The drop of nitrates in our experimental lot, from 1948 to 1950, as reported above, can be a serious and important warning of the necessity of maintaining the nitrogen balance in a soil. Here we are in complete agreement with the orthodox point of view, although we try to achieve this end by organic means. The importance of this is underlined by the fact that there is not enough nitrogen commercially available to cover the nitrogen needs of our land. Then too, the nitrogen fixing bacteria can increase the nitrogen content of soils to a much higher level, and do this much more cheaply, than it could be done by using commercial fertilizers in the amounts which the farmer could afford to buy. A third factor lies in the characteristic behavior of the nitrogen fixing bacteria. They will fix nitrogen in a medium low in it, but they will consume or waste nitrogen in a medium which is high in it. The farmer thus has the choice of either buying nitrogen as long as his money lasts, or of introducing natural, organic practices which will produce nitrogen without much additional cost.

TABLE 4. *Changes in Available Phosphate in Pounds Per Acre*
(The La Motte test was used to determine these values.)

CROP AREA	1948	1949	1950	1951
Blank Soil (untreated)	75	90		65
Beans M	400	190	180	125
Beans BD	150	150	150	125
Corn M	237	200	150	150
Corn BD	103	180	130	200
Tomatoes M	158	200	100	150
Tomatoes BD	150	190	100	140
Carrots M	400	150	100	150
Carrots BD	190	180	125	140
Peppers M		200	100	156
Peppers BD		100	150	160

Changes in available phosphate are mainly due to weather conditions; both dry and wet seasons having a considerable influence. There are also seasonal fluctuations in availability. It is for this reason that we only test and compare samples which are taken at the same time of year. The fallow of 1948

before the start of the experiment affected the soils so that at that time an extremely high available phosphate was observed. When the plots were under continuous cultivation and cropping, part of the available phosphate was locked up. The decline in later years is not necessarily a result of cropping but may be due to other soil changes. The answer to this question could only be given on the basis of parallel testing of total phosphates in the soil. Only then could we know whether there had been an absolute decline in phosphates or simply an exchange between total and available phosphates. As a consequence, we began to test for total phosphate content in 1951 and shall continue this in future. The determination of total phosphate was made with the official method as outlined for fertilizers by the AOAC. Here are the results in pounds per acre, assuming that the weight of the top 6 inches of soil is 2,000,000 pounds. The analytical data were originally obtained in per cent of the weight of the air dry sample.

TABLE 4a. *Total Phosphate in Pounds Per Acre*

Blank Soil	2000	Tomato Soil M	2000
Bean Soil M	3000	Tomato Soil BD	4000
Bean Soil BD	6000	Carrot Soil M	4000
Corn Soil M	2000	Carrot Soil BD	4000
Corn Soil BD	4000	Pepper Soil M	2000
		Pepper Soil BD	3000

From these figures it can be seen that the soils were not depleted in phosphates and that the differences are only in availability. None of the plants in any group showed phosphate deficiency symptoms as can be detected by leaf analysis. It can also be seen that some crops, such as beans, corn, tomatoes and peppers, were able to store up considerable reserves in the soil. The fertilizer and compost had provided a sufficient amount of phosphates for the growth of the plant.

These observations point toward a new avenue of research, namely the determination of availability in the case of various different treatments of soil and the determination of phosphate storage or waste under different systems. It is known and has been made public by competent sources (the Beltsville Maryland Experiment Station and others) that only a small fraction of phosphate fertilizer (10% on the average, with a minimum of 2% and a maximum of 20%) will be taken up by growing plants, while the rest is locked up in the soil or is lost. A revision of the usual conception of phosphate fertilizing is necessary in view of these facts, and organic, biological, and other factors should be discussed and investigated so as

to arrive at a better understanding. As our soil tests of BD farms over a period of years have shown, there is a rather constant level of available phosphate no matter how much phosphate in the form of manures or fertilizers has been applied. In other words, in no case has the soil been depleted in phosphate by organic management. To cast more light on this rather complex matter we quote from an article by S. R. Aldrich of Cornell University, which appeared in the ORANGE COUNTY FARM BUREAU NEWS of March 1951:

"Some of the best dairymen who use 20 per cent superphosphate in the stable have been supplying from 50 to 80 pounds of P_2O_5 per acre each year for the past ten to twenty years. The recommended amount is thirty pounds per acre per year. Seldom more than 20 is removed in a crop in one year.

"Rapid soil tests indicate that nearly 10 per cent of the fields on dairy and general farms contain enough phosphorus, so the farmer cannot expect to see a response on the current crop.

"There is no detrimental effect from applying excess phosphorus, but it is not economical, at least not in terms of the short-term crop response. On most farms the money could better be invested in more lime, potash, nitrogen or in some other farm need."

This season, as in previous ones, a marked difference in the vitamin A (carotene) content was observed. The carotene was determined after chromatographic extraction with a spectrophotometer against standard solutions.

TABLE 5. *Carotene Content in Gammas Per Gram of Sample*
(1 gamma equals one thousandth of one milligram.)

Crop and Plant Part Tested	1949	1950	1951
Corn Leaves M	54.0	50.0	58.5
Corn Leaves BD	91.2	90.0	94.5
Corn Seed M			54.0
Corn Seed BD			103.5
Tomato Leaves M	35.1		58.5
Tomato Leaves BD	47.2		72.0
Tomato Fruit M		51.5	81.0
Tomato Fruit BD		81.9	101.3
Carrot Root M		18.0	63.0
Carrot Root BD		20.0	81.0
Pepper Leaves M		90.0	54.0
Pepper Leaves BD		110.0	83.3
Bean Leaves M	13.5	12.0	9.0
Bean Leaves BD	56.2	45.0	45.0

In order to arrive at findings which may truly be compared, one selects leaves of equal size, age, and degree of maturity and seed or fruit of equal size and maturity. Annual fluctuations are clearly discernible. The wet summer of 1950 had a de-

pressing effect on some vegetables. Throughout, however, the BD vegetables have much higher carotene values. These results are in complete contradiction to other publications where it is stated that *no differences* in vitamin content were observed in the course of experiments testing the effects of inorganic and organic treatments.

We have encountered such statements quite often in recent years. They are used in support of other statements to the effect that there is no advantage in the use of composts over fertilizers. The question is, of course, what kind of organic treatment and compost was used. To simply use "compost" and not pay attention to the NPK in said compost, or to neglect the wide variations in quality and fertilizer values of composts resulting from different methods of bacterial breakdown, can lead to such statements that "no differences" were observed. With all respect for the sincerity of such investigators, it must be stated that they probably don't know all about compost as yet, nor are they aware of the science and art of directed compost fermentation. There is a great difference between "chance" decomposition and a directed fermentation. Certain soil bacteria develop vitamins such as B12 or other growth stimulating factors. Others, even though they may break down organic matter, do not develop such growth factors. This, in turn, brings about differences in the root system and growth of vegetable crops and hence the difference in vitamin and protein content.

Further tests to substantiate our statement are in preparation and will be published in due time. This much can be said at present, however: the vitamin content of crops grown with different organic fertilizers, composts and manures, whether treated or untreated, can fluctuate as much as 200%.

To write as Professor S. A. Waksman did recently in BETTER CROPS WITH PLANT FOOD (Vol. XXXV, No. 9, Nov. 1951) under the title "Concerning Bio-Dynamic Farming and Organic Farming," is to write inaccurately to say the least. He says there, on page 43: The "biodynamic groups are actually offering for sale a mysterious biodynamic substance to be used as an inoculum for composts. The fact that equally good composts of stable manure can easily be prepared without such supplementary substances is overlooked thereby. All that is required is addition of certain mineral fertilizers, in order to obtain excellent composts from plant residues, such as straw, corn-

stalks, leaves, and other vegetable refuse." Our experience has been quite the opposite of this. Waksman, by the way, contradicts himself on page 24: "The process of decomposition of plant and animal residues—leading to humus formation is highly important in making soil fertile, since the continuous stream of carbon dioxide, ammonia and nitrate, and phosphate, resulting from such decomposition is highly important for continuous plant growth."

I have the greatest respect and admiration for Professor Waksman's work. When it is a matter of using bacterial cultures to influence and direct the fermentation of compost, he ought to know better. He has some of the important soil bacteria right there in his laboratory. If proper tests were conducted, he might learn differently, if he so wishes. How could we break down city garbage with our bacterial treatment at the rate of 100 tons per day within a few weeks, without bad odors, without losses of ammonia, and create an entirely new fermentation industry, were Professor Waksman's statement true? Even someone who knows nothing as yet about directed compost fermentation must needs admit that certain well-known and well-described bacteria and yeasts play an important role in other fields of fermentation, in cheese, in milk (Yogurt and Acidophilus), in wine, in bread. Modern techniques in these fields do not permit accidental inoculation to take place but introduce quite specific cultures in order to achieve specific ends. American wines of a Bordeaux, or Rhine, or Burgundy, or Riesling type are only possible because certain specific cultures have been used. Bread made from dough inoculated quite by chance with wild yeast would be quite unpalatable. It is the typical baker's yeast which makes the dough rise and results in edible bread. To deny, therefore, to the composting process, that such specific microorganims could be found and used which direct its proper fermentation is a retrogressive and not a progressive concept—inasmuch as experience has already shown that it works, wherever and whenever adequate knowledge and skills are applied.

It is regrettable that some of our greatest authorities want to stem the tide instead of getting busy and discovering something perhaps much better than that which we have already: namely, methods to produce higher vitamin contents, to preserve and increase nitrogen resources, to increase organic matter—in short, to raise the level of quantitative and qualitative

agricultural production. We should never forget that to stand still is to make the first backward step, while progress is made by searching for ever new processes and methods. That which was good yesterday may already be inadequate tomorrow.

It is my pleasure to thank all those who contributed to these experiments: my helpers in the garden and laboratory (Mrs. Alice Heckel, Mrs. Erica Sabarth, Mrs. Mathilde Vibber), and the Bio-Dynamic Farming and Gardening Association and other friends who contributed the necessary funds.

AGRICULTURE IN MEXICO

CARLOS CABALLERO

During the summer and fall of 1951 *the author, who farms on a fairly large scale at Tlaxco, was engaged in an intensive study of Bio-Dynamics. He divided his time between Dr. Pfeiffer's laboratory at Spring Valley, and some of the larger B. D. farms in the northeast. The editors of Bio-Dynamics asked him, as he was leaving, if he would not please write a piece about farming and farm problems "out his way." The following interesting article is the result.*

* * *

Mexico has been called a country of contrasts, and this is especially true if we talk about agriculture. The *geography* of the country is responsible for these contrasts, some of which are at the same time among the main attractions for the tourist. For instance, in the north of the State of Veracruz you will find coniferous forests, and fields of wheat, barley, and oats. In the same state, and only a few miles away from the evergreens and grain lands, you can have around you the luxuriant tropical vegetation of an utterly different kind of forest, where beautiful orchids grow wild on the trees. And the farmers here have plantations of bananas, coffee, vanilla. It is a question of altitude.

With these tremendous differences in climate and topography, the characteristics and problems of Mexican agriculture are unique, peculiar in nature and different from each other, when considered from either the economic, technical or sociolo-ical points of view. Here I intend only to outline some of those things with respect to which one can more or less generalize.

The majority of the Mexican population derives a living from agriculture, in a country of which the larger part of its territory is not suitable for agriculture, being either desert-like

or mountainous. The main agricultural resources of Mexico are along the coasts. However, at the present time neither communications nor sanitary conditions are very good in many of these areas, and so the full utilization of their potentialities is impossible.

Something very sad, is the economic situation of the larger part of the agricultural population. According to Gonzalo Blanco: fourteen per cent has been exploited by Mexican feudalism, 36% lives under very bad conditions and without aspirations, and 38% is undergoing great poverty. Only 1.4% of the total population of the country has a monthly income of more than 1,000.00 pesos ($120.00).

The history of the past few years can give us some information to help fill out this picture. Prior to 1915 the land was in the hands of a few, and the country was living under conditions similar to those present in the Middle Ages. Thereafter, the Mexican Agrarian Revolution changed the situation. The land was divided into small plots and given to the peons, and the ejidos or communal farms were created.

This movement had tremendous consequences for our economic, social, cultural and political life. I will mention only a few examples of the things that happened on the fields: Some of the people that received land were not real farmers; they had other activities that engaged them, and only saw the opportunity of "having a piece of land of their own." Consequently, they did not take care of the land, and the soil was destroyed. Some who received their 20 acres of land got a piece in such bad condition that it *could not* support them. Many others simply *exploited* the soil in an irrational fashion, finally deserted it and then went on to make a living from the destruction of the forests. Only a small percentage, with better organization and with technical and economic help, succeeded. The agricultural production of the entire country showed a tremendous drop, and great quantities of foods had to be imported. Even corn and beans, the main foods in the Mexican diet, had to be imported. In the general insecurity of the possession of the land, very little was built up and a good bit was destroyed.

Now you have an explanation of why many Mexicans, with no chances of profitable work in the Mexican fields, illegally cross the Mexican-American border in order to get a few dollars that—with our low rate of exchange—will mean many pesos for them, and have a good piece of adventure thrown in besides.

It should be emphasized that the foregoing more or less recent history is not the only thing that is responsible for the deforestation and erosion that are not only the main agricultural problems but are the main national problems of Mexico. The fact is that our ancestors, Spaniards or Indians, had not been good conservationists, and the destruction of the Mexican soil started many years ago.

All this is the dark part of the picture, but fortunately there is another side, and it is promising.

Today the Mexican farmer has more security in the possession of the land, and he has more scientific and technical information and help. The old agricultural practices—some of them are the same as those used by the Aztecs—are on the way to disappearing. The publication of agricultural books has increased, and very often we see in the chief newspapers articles with agricultural information. We hope that very soon radio, television and movies will also make their contribution to this spreading of information.

We cannot be just if we do not recognize the help that the Government has given to the farmer in the last years. Also the cooperation between the American and Mexican Governments has been a definite help. The best proof of that is the control of the foot and mouth disease.

The agricultural schools have increased in number, and they are better organized annd equipped. It is true that many of the boys graduated from those schools, and some that have received technical training abroad, are absorbed by the bureaucratic and political machinery, but many of them are doing constructive and efficient work.

Experiment stations have been established, and in this connection the work of the Rockefeller Foundation is worthy of mention, especially as far as seed selection and seed improvement is concerned.

Agricultural machinery is being used more and more every day. Mexico is the Latin-American country that has imported the most agricultural machinery from the U. S. A., Canada and Europe. The International Harvester Company operates a plant in Saltillo, and an increasing volume of implements of Mexican manufacture is now on the market.

Crop rotation is increasingly practiced and better understood. Strip cropping, contour cultivation, green manuring and many other soil conservation practices have received more at-

tention than in the past. The destruction of the forests is being controlled. A large percentage of the population still depends on wood and "vegetable coal" for heating purposes, but with their increasing unavailability, the popularity of petroleum products and electricity increases very fast.

Irrigation has made tremendous contributions to the prosperity of our agriculture, and thousands of acres that were formerly useless are now under cultivation. There have been numerous dams built recently, and along the Papaloapan River a project similar to that of the Tennessee Valley is under construction. The farmers now have more credit, and have it under more favorable conditions. There is better control of agricultural prices, and very soon the producers will be free of the unscrupulous dealers who, at the present time, are the only ones that make good profits from agriculture.

Another important factor in the whole picture is the program of colonization of isolated regions that is being carried out in order to have a better distribution of the population.

One is happy to see that step by step our legislators, politicians, teachers, rural sociologists, economists and technicians are getting a better understanding of the problems of the practical farmer who has to make a living from his farm. This development is a definite factor in our economic progress and in our industrial and cultural development.

In this progress of the evolution of Mexican agriculture, many mistakes have been made, but if we recognize human limitations and imperfections, then we have an obligation to limit ourselves to constructive criticism, and to talk against errors only if we have the solution in our hands, and can prove it.

We dislike seeing in our fields the ruins brought by destructive practices, but it should, and does, make us feel that something constructive has to be done; and this, as far as we are able, is what we are doing.

There is a problem that at the present time has not received enough attention, and this is the question of the conservation and increase of organic matter as the main factor in the building up of the exhausted fertility of our soils. In the tropical regions, when a field is cleaned up before planting, all the vegetable residues are burned. In new fields, tremendous quantities of useful wood are burned; also the old custom of burning the sugar fields still prevails in some places. Great amounts of straw,

corncobs and dry manure are burned every year. In my own state, Tlaxcala, the straw of wheat is burned because it is considered useless—only the ashes are used as fertilizer. Compost making is almost an unknown practice.

Fortunately, Sr. Lorenzo Patiño, the director of the Mexican Soil Conservation Service, is very much interested in this respect. Some demonstrations of how to use straw as a source of humus have been made during the past year. This process is similar to that described by A. Demolon, H. Burgevin and M. Marcel in the pamphlet, "Le fumier artificiel et ses applications," Paris, 1935.

It is in this field of organic matter application and conservation that we hope to make our small contribution, with the help of the Biochemical Research Laboratory at Spring Valley, N. Y., directed by Dr. E. Pfeiffer.

We have confidence in the success of our work, because anything that is done for the good of Mexico is welcomed by Mexicans.

POISONOUS POULTRY?

Reprint from the SCIENTIFIC AMERICAN, January 1952, page 38.

Antibiotics speed the growth of chicks and turkeys, and U. S. raisers are now feeding them to poultry on a large scale. Mortimer P. Starr and Donald M. Reynolds, bacteriologist at the University of California, warn that this practice may have dangerous results. Chicks raised on antibiotics, they suggest, may develop resistant bacteria and poison people who eat them.

Examining the intestines of turkeys grown on a diet supplemented with streptomycin, the two investigators found that the birds had developed large numbers of streptomycin-resistant bacteria. It took only three days for a bacteria population completely resistant to the drug to appear in such birds.

Starr and Reynolds point out that poultry commonly carry a parasite, Salmonella, which can cause food poisoning, enteritis and typhoidal infections in man. If the feeding of antibiotics* produces resistant varieties of the parasite, the organism may not only poison human consumers but be immune to treatment with drugs.

*It is realized that the different antibiotics vary greatly as regards the development of resistant bacteria.—Ed. Bio-Dynamics.

GREEN MANURING, ORGANIC FERTILIZER, COMPOST IN SPRING?

This question has often been discussed in scientific and agricultural literature and asked by our readers ever and again: Why does green manuring not always give the desired results when the crop is turned under in Spring? Some people even go so far as to say that one should not apply compost or other organic fertilizer, as well as green manure crops, in Spring because they cannot act, since they tie down the soil bacteria until they are sufficiently decomposed.

There is a certain amount of truth in the observations which have led to this opinion, but the difficulty can easily be overcome if one knows about the proper decomposition of organic materials in soils and in compost. We have long made a differentiation between raw organic matter and digested organic matter. For many years, the writer has urged that only that fraction of organic matter which has been digested by soil organisms and completely decomposed be called *humus*.

Green manure crops which are plowed or disked under in Spring take time to decompose. During this period they demand the action of the soil life and bacteria and these are thus not able and available to activate the soil minerals until and unless the green manure is decomposed. The beneficial effect of green manuring and compost is therefore only felt after some time elapses, frequently only by the late Summer crops or even not until the following growing season. The effect of green manuring is slow to appear but it also lasts longer. Experimental stations have found that its good effects are most evident in the second and third years. This rule also applies to the use of fresh manure and partially decomposed compost which still contains a high fraction of raw organic materials.

The problem is best illustrated if one understands what happens to nitrogen in the soil. Even though green manure crops, especially legumes, contain a large amount of organic nitrogen, the nitrogen bacteria in soil will not work on the soil but on the masses of green material. Hence temporary nitrogen deficiencies appear and the crop immediately following is inadequately nourished. Some twenty years ago, the writer plowed under a crop of Winter vetch on heavy, moist, clay soil and planted potatoes afterward. The results were very poor in spite

of the fact that all the necessary plant food was present. The tieing down of the nitrogen bacteria during this period of decomposition is sometimes overcome by the addition of nitrogen fertilizers. In fact, when stubble or straw is plowed under, the orthodox school of agriculture recommends adding nitrogen in order to speed up the decomposition. Similar problems exist in compost piles, and it has been stated that unless the ratio of carbon to nitrogen is nearly 11 to 1, successful decomposition cannot be obtained.

In our bio-dynamic practice, we acknowledge the truth of these observations, but point to the fact that the decomposition of green manures and compost can be speeded up before the next crop is sown or the compost is applied. One reason why we add the bio-dynamic preparations or the bacterial compost starter (BD Starter) which has been developed recently by the Biochemical Research Laboratory, Threefold Farm, Spring Valley, N. Y., is that we want to PRE-DIGEST the green manures and compost before the seeds are sown in the soil. Completely humified compost does not tie down soil life and its nutriments are immediately available. The fact that the quantity of immediately available minerals is many times higher in a treated compost than in an untreated one can be demonstrated by chemical tests. No nitrogen is tied down when the BD Starter is used and the green manure is broken down much more quickly, long before the seedlings begin to grow and require available plant food.

One method of applying the BD Starter has recently been practiced and found to be very valuable in California. There the starter is distributed by the Compost Corporation of America in Oakland, and is sprayed over green manure crops, stubble, crop residues, etc., just prior to disking them under. These disked under crops and crop residues in turn decompose very rapidly under the influence of large numbers of soil and breakdown bacteria. Growers in the salad bowl of the country, in the Salinas area, are very enthusiastic about the results. They have observed that the field which received the starter could be worked much more easily, required three days less labor in preparation for the next crop than the control field worked as usual without the starter application. Lettuce plowed under decomposed within a few weeks and barley stubble took just half the usual breakdown time. This accelerating effect was so noticeable that the starter is now sprayed by airplane where the topography permits its use.

Crop dusting airplane companies have taken up this task and developed special methods so as to bring the starter right to the surface of the field. The pilots fly only one or two feet above the ground. The plane has a spray rig which forces a

Unsprayed Section of Lettuce Field
(Note caked soil, uneven catch.)

Sprayed Section of Same Field
(Note friable soil, even growth.)

fine mist of the bacterial spray into the soil and the farmer waits with his disk right at the edge of the particular field in order to disk under the green material, stubble, etc. immediately. In this way nothing is lost and the maximum effect is obtained. One result is that the stubble and straw disappears completely within a few weeks and there are no remainders of it to handicap cultivation and seeding.

The photographs shown here illustrate the contrast between two sections of a lettuce field where barley stubble had been plowed under six weeks previously. On the field section treated with the bacterial starter very little if any stubble is left, the soil has become smooth and friable, while on the untreated control section much stubble remains and has impaired the regular seeding and catch of the lettuce. More than 2,000 acres have been treated successfully in this way. The same results have been observed when plowing under vetch, broccoli and cabbage.

How *powerfully* the Starter spray acts through its balanced and rich content of decomposition and soil bacteria can be gathered from the fact that only 2 to 4 oz. of the cultures are used per acre. When sprayed by airplane these are diluted in 5 gallons of water per acre, and the specially rigged plane can cover 40 acres in thirty minutes. The cost is reasonable: $5.50 per acre sprayed, inclusive of the starter.

An entirely new industry has been created in this way, and the idea that green manures or partially decomposed organic materials can tie up soil life and nitrogen belongs to the past. Many years of research and observations have contributed to the development of this new process. The additional starter treatment has also proved its worth in the decomposition of organic wastes, garbage from municipal sources and manures. City garbage is decomposed in the brief time of 2 to 3 weeks, without bad odors, without tieing down nitrogen. In fact, the nitrogen fixing bacteria work with vigor and enthusiasm on such composts and even increase their nitrogen content. Predigestion makes possible the most efficient and effective use of composts. Where airplanes cannot be used, in hilly territory and on small farms and gardens, the starter can be sprayed by hand or with a ground rig. In such cases the amount of water for dilution is adjusted to the implement used for spraying, anywhere from 5 to 50 gallons per acre. At some later date further data and information about this problem will appear in these pages.

E. E. Pfeiffer

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E. E. Pfeiffer

SUCCESS WITH BIO–DYNAMICS

EVELYN SPEIDEN

Are you the sort of person who can make yourself do something you don't like doing when there is only an inner urge, no outer circumstances compelling you to act? Upon your personal answer to this question probably depends your personal success with the Bio-Dynamic method. "But I am doing things I don't like to do every day," you say. True enough, but isn't there usually some urgent reason outside of yourself—office routine—you have to earn a living; household chores—the family has to eat. A certain amount of discipline is good for us all and life will usually see that we get it, but to be able to discipline ourselves, that is another matter.

The practice of the Bio-Dynamic method is an excellent test. "How so?" you wonder, "When I want very much to do it? I want the good food it gives, the soil improvement, decrease in pests and diseases, beautiful flowers on sturdy plants, the all around health insurance for the future! I'll get those preparations into the compost pile tomorrow. It's too wet today," or "The soil is a little frozen," or "I'm too tired this evening," or "Yes, I have everything ready except a stick to stir the 507." When tomorrow comes, circumstances are no better, and so a week—two weeks go by, and when you finally give the fifteen minutes to the job, the preps have already deteriorated considerably.

"Oh well," you think, "I did the best I could (?) and probably we'll get some good from them." Nevertheless, with everything that goes wrong in your garden next summer, will you think, "This Bio-Dynamic method doesn't help as much as I thought it would," or will you admit to yourself, "Perhaps it would have been better if I'd put those preps in the pile the day they arrived. I'll try again."?

Probably, however, this does not apply to you because you've used the 502 to 507 in your compost piles often enough to know what a small matter it is to put them in, very simple when you get used to it. "But those sprays, I'm not so sure about. They are so different from ordinary sprays that I feel uncertain about how to handle them,* and it is really quite a task to stir for an hour. It's already rather late this spring to get the 500. Guess I'll wait until fall to order that and then the 501 can come next

* Spring, Summer, Autumn and Winter 1950 issues of Bio-Dynamics contain complete directions for the use of the sprays.

summer instead of now when I have so many other things to do." And so your garden remains for another whole year without the refinements and superior quality that you could have. For it does not become fully a Bio-Dynamic garden without sprays 500, 501 and 508, as well as the 502 to 507 in the piles; the dynamic, growth-stimulating effects come only after the good biological foundation is laid. Of course, there is more to the Bio-Dynamic method than the use of these preparations. It is based on sound agricultural and tested organic practices that may be used with benefit anywhere. It helps us to be more observant, to work not mechanically but in harmony with the conditions of life, to recognize disturbed balances and to strive to restore them. It adds the artistic touch to the science of farming and gardening, but the artistic feeling must be based on a scientific foundation, not on guesswork. Darwin said in essence long ago what Dr. Pfeiffer says in "Bio-Dynamic Farming and Gardening," "The nourishment of a plant consists in the assimilation of salts, of water, and of carbonic acid taken from the air. Its total mass is . . . ninety percent and more of water. Only from two to five percent of its mass come from salts taken from the soil. Thus it is a surprising fact that *the plant receives an important part of its nourishment from the air* which we can neither fertilize nor influence in any way—and *only a relatively small amount is received from the soil* which we *can* and *do* influence and fertilize." This also suggests the "dynamic" field where we deal with trace elements, bacterial and other microscopic life, hormones, bio-catalysts and the like.

The basis for all this still lies in your compost pile. To make good compost is the first and fundamental recommendation when we are asked, "We want our place 100% Bio-Dynamic. How shall we begin?" Collect all the decayable material you can lay hands on, from your own place first, then farther afield—fallen leaves (Don't believe it if anyone tells you they are of no value), grass and weed cuttings, sod, garbage (including orange and grapefruit skins), old hay or straw or chaff, crab pickings, cannery wastes (without poison from sprays if you can get it so), garden or other refuse, and so on. Old, or preferably fresh manure of any sort is valuable but not necessary. The more varied and well-mixed the material, the better the end product.

Yes, of course, all this stuff will decay in spite of you. That is the natural thing for organic waste to do. But there are various end products of decay. The chemists say they are carbon di-

oxide and water, neither of which give us the help we need. Or we might get raw or acid humus. There is only one thing we want from our compost work—neutral, colloidal humus, the top quality material for soil and health improvement. The Bio-Dynamic preparations 502 to 507 direct the decay process to this end,* provided we give them the proper biological environment,-

1. Moisture—neither flood nor drought.
2. Warmth—not killing heat. Cold is harmless but delaying.
3. Darkness—some, but not too much, sunlight.
4. Air—throughout, but not drying wind.

You can figure how best to get these conditions according to your situation, and the longer you work with compost, the more you will realize their importance.

So pile up your mixture (thin layers of each have proved best) in a shallow foundation at least six inches deep so there is direct contact with the soil, and you also have a pile of earth to one side for layering and covering. Almost any shape foundation will do, but with a large pile it is better not over six feet wide (and any length) so that air penetrates from each side. If you are a novice do not make your base too large. That immense pile of material you have on hand will shrink more than you can imagine until you watch it sink and sink. Alternate your thin layers of organic material with sprinklings of lime (quick lime or ground agricultural limestone, not hydrated lime**) and of soil. If you have manure in the pile, see that it does not come in contact with the lime as this liberates valuable nitrogen. When the pile is high as possible without getting too narrow so it dries out at the top, cover with a thin skin of soil. This gives some protection from drying but is not enough to cake and shut out air. Keep it broken-up and free from grass and weeds. In hot weather an additional straw mulch is beneficial, especially if the location is sunny.

Watch the pile's moisture content by digging into the side of it now and then. Gray patches mean dryness from too much heating. A crowbar is your best compost companion for a pile either too wet or too dry. With it poke holes all over and deep into the pile. For dryness pour water into the holes, or let the hose run in; for slimy, green or gray, evil smelling wet spots, leave the holes open a few days and the access of air will soon change

* For explanation of how they work see Bio-Dynamics, Summer 1948.
** See Bio-Dynamics, Vol VII, No. 5, page 15 for details on use of lime.

the flora. A rightly cared for pile will not need to be turned. "A crowbar in time, saves a turn."

Earthworms, yes these are good for a pile. To put some in is a good thing but not necessary. They will find their way there if conditions suit them, and their presence is one of the best indications that things are going well. Once the pile is thoroughly decayed, however, they either die and leave their egg capsules or they go in search of new rotting fields on which to feed. So don't be alarmed if you find them absent when you spread the humus. And if you have been able to locate your compost pile in a good spot which you can continue to use for pile after pile, your earthworm crop will increase.

The preparations 502 to 507 have been compared to yeast in bread. There is "wild yeast" in the air and a damp flour mixture left lying around long enough is likely to show some effect from it, but we'd get no good bread that way. Instead we control amounts, temperature, moisture, etc. when we make bread, in order to get a definite result. So with a compost pile. Without the preparations it would decay—somehow, sometime; but why rely on chance when there is a scientifically definite and speedy way of getting exactly what you want—neutral, colloidal humus? Every reader of Bio-Dynamics who is privileged to handle soil should be working in this scientific way—and soon your neighbors and relatives will be doing it, too, if they watch you. Soil deterioration is proceeding and pests and poisons increasing too fast for us to waste time on less certain methods. In addition to helping yourself, you are performing a social service to humanity and the earth as a whole when you contribute to soil fertility. Great areas of land so treated are needed instead of tiny patches here and there. And it looks as if this might come about through Dr. Pfeiffer's municipal garbage—"Comco"—project in California. Already they are spraying Bio-Dynamic "soil building" material from airplanes over many hundreds of acres and with very satisfying results.

Directions for the use of Bio-Dynamic Preparations 502 *to* 507.

These preparations come to you, one teaspoonful of each, carefully wrapped, sealed and mailed in a tin can. This is the best way we have found for preserving their essential moisture content, *but* they are living material and must not be so shut away from air for long. Also they are inoculators for decay and will rot through their envelopes and packing so that you cannot distinguish one from another before long. And if after opening,

they lie around long enough to dry out, they have lost their value. Re-wetting does not help. So don't delay getting them into your compost or manure pile. If necessary to store a few days, keep in a cool, dark, damp place away from machinery and not in the refrigerator. One set of the six is enough for about 15 tons, that is, a pile 21 feet long and 6 feet wide and as high as can be made with sloping sides.

502 to 506 are each different, rich-looking, humus-like materials; 507 is a liquid. All are made from plants. Each of the six must go into its own separate hole—no mixing. So get your crowbar and make six holes not over three feet apart and scattered evenly over whatever sized pile you have. Thus one set will take care of a pile 21 feet long and not over 6 or 8 feet wide. A larger pile must have 2 or more sets, a smaller one still needs a whole set. Holes should be straight down and of a depth that will put the preparation about half way down the pile when it is dropped to the bottom of the hole.

The 507 liquid is emptied into a gallon of lukewarm water (rain water preferable, at least water not containing chemicals) and stirred ten full minutes vigorously, first in one direction and then in the other. Half of this is poured into one of the six holes. Reserve the rest. Empty the envelopes of 502 to 506, one at a time into your hand and drop the contents of each in its hole. Fill all six holes with good soil or old compost to make sure the preparation has a good contact with its surroundings and is not left in an air pocket. Finally, spray the remaining 507 over the whole pile, in a fine mist spray if possible.

Do not fail to watch the pile, digging into the side occasionally to examine. A temperature over 150 degrees is harmful, about 120 degrees is the best. A pile once thoroughly dried out must be completely rebuilt and wet as moved, but if fermentation proceeds properly and continuously, a pile should not need turning. There are three stages of fermentation towards humus with manure or compost,—

1. The original smell disappears and the material takes on a woodsy odor.
2. The color becomes a uniform, dark brown.
3. The original texture disappears and it looks like rich soil.

The material may be used, if necessary, between the second and third stages, but this is not ideal and may scatter weed seeds, etc. If so used, leave on the surface awhile as a mulch and gradually work it into the topsoil as it disintegrates. Generally, however,

ripe compost should be mixed with the topsoil *immediately* after spreading (but not plowed in deeply, a harrow is better, or a disc or hoe) to prevent its deterioration. The exception to this is when your humus (manure or compost) is spread in early spring on frozen ground or snow. Remember that heat, strong sunlight, drying wind and drought are destructive to humus. Protect it as you would the fine hair roots of plants. It is alive.

FARMING IN THE RIO GRANDE VALLEY

PETER A. ESCHER

The lower Rio Grande Valley area lies across from Mexico. To the East is the Gulf, North and West are semi-arid ranch lands. The main city is Brownsville. There are a couple of dozen other towns in the area, all very important, according to their Chambers of Commerce. Needless to say the region is in Texas.

The original population, which is in the majority, is of Mexican descent. They are mostly laborers but a good many are land-owners. They are a gentle, lovable people who frequently talk at a great rate. They have to learn English in school but prefer to stick to their own brand of Spanish.

The Anglo-American settlements are of relatively recent origin. A hundred years ago occupation by American troops started. At the beginning of the present century an enterprising speculator came down here and saw the possibilities, namely very fertile soils, overgrown with Ebanos and other leguminous trees, a subtropical and relatively moist climate with a long growing season, and what was then thought to be an unlimited supply of water for irrigation. The speculator bought up options on a very large acreage. Then he turned around and convinced the railroads of the possibilities of the region. In order to accommodate the visitors he even had to furnish the local hostelry.

In the first decade of this century the railroads extended their lines down here, and development and speculation started in with a bang.

The irrigated area consisted of about 5,000 acres in 1904, grew to 200,000 in 1920, remained stationary till 1940, to reach well over 600,000 acres in 1950.

Originally rice and sugar cane were the predominant irrigated crops, to be replaced, with improved transportation, by vegetables, followed in the twenties by citrus groves which are famous for the pink grapefruit.

The area reaches about 60 miles along the river and some 30 miles inland. Some of the outlying regions are not irrigated. Whereas the cotton yield is of about 2½ to 3 bales per acre in irrigated fields it is only about 1 bale in the dry regions.

On a very windy day I passed through the dry region. The wind swept the dust across the fields as it often sweeps snow. Dust clouds formed and traveled not unlike fog. Upon coming home I found that I had acquired a tan which I promptly shed in the bath tub.

The major crop is cotton. The yield is higher than in the so-called Deep South. It is planted in February and harvested in June-July-August. For every bale of cotton the ginner has to keep a certain amount of the price in escrow. This sum will be paid to the farmer if he plows or disks his cotton under before September first. This measure is taken in order to control the Pink Boll Weevil, and appears quite effective. If it were possible to let the cotton grow till December yields of 4 to 5 bales per acre could be attained. The cotton gin waste has to be burned for the same reason. It may be composted, and a few farmers do this.

The citrus crop used to rank second in importance. In February '51, however, was a freeze. The first one in forty years. It lasted 4 or 5 days. The thermometer hovered around 20. Most of the thermometers do not reach that far down. Most of the citrus trees were killed outright. Eighty percent of the trees have been taken out and burned. The remaining 20% are either very young trees or a miserable lot of mere stumps. The citrus crop this year was negligible. The majority of oranges and grapefruit consumed locally had to be imported from other citrus regions. Overnight the face of the Valley has been changed from a region with many groves to a region of wide open fields.

The winds here are quite strong and come generally from the south, and then after a calm the wind blows again either from north or south. The citrus groves served, quite unintentionally, as windbreaks and helped to preserve the moisture.

It is noted that parts of orchards suffered relatively little, whereas the remainder had to be pulled out. The parts where the water table is lower suffered considerably less than those with a high water table. Around Brownsville in the Delta where the citrus roots quite often grow horizontally, hardly a tree is left.

It wasn't only the loss of crop that hurt. A grove takes 10 to 15 years to bear the maximum. Groves fetch high prices, several times higher than other crop land.

One farmer I know hired a bulldozer during the freeze, started to pull up trees, cleared the land of roots, tilled it and planted a crop of cotton inside of six weeks. That, to my mind is good management. The man in question has been farming for 20 years lost crop and grove and has to start practically from scratch again. These soils have to be tilled many times before planting because not only the crops but also the weeds grow abundantly.

The second crop in importance now is vegetables. In one part are a few Japanese who do a very good job of growing specialty crops such as Brussels Sprouts.

The majority of the farmers grow cabbages, lettuce, and turnip greens in winter. In February tomatoes will be planted.

We all know it doesn't take long to plant vegetables, it takes a good bit of work to cultivate them, but when you have to harvest a truck crop you have to have help. In December there were several carloads of vegetables a day that couldn't be harvested, due to the labor problem. The planting and cultivating is mostly done by local help. The harvesting is done by imported Mexican laborers, the so-called braceros. Some Mexicans cross the border illegally, they are called wetbacks. There appear to be quite a few of them around. If you want to get any help legally you have to pay for the bracero's travel expenses from Mexico. If he doesn't approve of the working conditions he is at liberty to work for someone else but YOU still have to pay for his fare home. This agreement has been achieved by negotiations between Washington and Mexico. Recently American and Mexican farming organizations got together and agreed that most of these problems could be better handled locally.

Right now negotiations for this year's contract are under way. One effect is that contract labor is practically unobtainable. The other day the Border Patrol called on a neighboring farm and left with a truck load of "wetbacks" as the illegal help is called. Most of those thus deported reappeared at work the next morning.

Anyhow the effect of the uncertainty of a labor supply at harvest time is that fewer vegetables will be grown and more and more cotton planted. More and more cotton is being

harvested by machinery. A cotton harvester is needed for about 150 acres. It is a highly intricate machine and rather expensive.

The rapid growth and the long growing season permit the farmer to grow a second crop in fall. Some grow a cover crop to be followed by cotton in spring, some let the weeds grow and plow them under. Some grow a truck crop in fall. Other farmers keep some land in permanent pastures and grow some hay in fall to feed their steers. The local steers are small—about 700 lbs.

Originally this area was used for range land. Nowadays only the submarginal lands are used as range. Before the age of the railroad and refrigeration, cattle were sold for hide and tallow. Large animals were wanted. I have seen several bulls weighing a ton each and some beef cows weighing 3,000 lbs. Quite an animal when you consider that a large Holstein cow weighs 1,000 lbs.

The crucial question, which people up North do not have to worry about quite as much, is the water problem. The rainfall in Brownsville is about 25″ to 30″ per year. The precipitation occurs mostly in spring and fall. The rain can either be a hardly noticeable drizzle or it can pour with all its subtropical violence. There is, however a good bit of dew and condensed fog. Most mornings the plants are covered with a heavy dew which is sufficient to keep them growing, especially in the fields with a higher organic matter content.

All the land is irrigated with water from the Rio Grande. It is obvious to any individual that, if there is a certain supply of water, that's all there is. This does not, however, appear to be obvious to a group or groups of people. A farmer I know has not been able to plant his alfalfa for hay. There hasn't been any water available to him for a while. Yet there is still land being cleared for irrigation.

During summer often no water is available for irrigation. This limits the type of crops that can be planted. Cotton, once established, doesn't need any irrigation.

The area is divided into irrigation districts. These districts pump water through canals which criss-cross the area. The irrigation companies are owned by the landowners of the district, who elect the officers of the company. The officers adjudicate use of the precious liquid and ration it when the supply is short. Woe to the man who uses it surreptitiously. The water supply for his house may be cut off. Respect for him in the

community is not exactly enhanced. The water is paid for by the acreage under cultivation and the amount of water used. Some of the land is served by individual or private pumpers, while some of the farms have no water rights. In order to keep the river from overflowing, which used to happen in the good old days, Floodways were built. The Floodways are very wide, the rate of flow of the water in this level region is slow, so that a lot of silt is deposited. This has nearly maintained the fertility of these fields. Quite a few of these farms do not use any commercial fertilizer as yet.

The Rio Grande has its source somewhere in Southern Colorado. It winds its way south through New Mexico to El Paso and thence southwest to the Gulf. Most of its water comes from semi-arid regions. Such water has a higher salt content than water from regions with a high rainfall. I am told that the chlorine content of the Rio Grande water is 225 p.p.m. (parts per Million).

Quite a few drainage ditches have been built to keep the water table at a certain level during wet spells and to keep the chlorine from accumulating in the soil.

The Rio Grande is being dammed up a couple of counties up the river. This will help to stabilize the flow.

The Mexicans have also discovered that you can grow more with irrigation. They have dammed up one of their rivers contributory to the Rio Grande, with more rivers to follow in the near future. I understand that the water from Mexican rivers has a lower chlorine content than that of the Rio Grande. If they are dammed up, there will not only be less water available here for irrigation but it will also have a higher chlorine content.

The farmers are very careful with irrigating, they let the water flow slowly through the furrows across the field and stop its flow quite a distance before it has reached the further end of the field. White flakes can sometimes be seen on fields after irrigation. The fields are carefully levelled with special machines. Subsoilers are used extensively to prevent salt deposits. Most of the fields are 20 - 30 acres. There are a good many large fields of 100 or 200 acres. To irrigate one of these must be quite a responsibility

The soils have a tendency to become alkaline. Calcium content is far too high while magnesium is often absent. The organic matter content is rapidly decreasing. The few places that have been using compost have been able to reduce the rapid de-

terioration of organic matter due to heat and dryness. The soils near the Delta are generally quite sticky and have a tendency to cake, especially when the organic matter content is low. The fields have to be tilled many times before a crop can be planted. The evergrowing weeds are kept under control and the clods are broken up. Fields with a lower organic matter content have to be tilled more often.

The soils appear grateful for any organic matter added to them. They are springier, absorb and retain moisture readily. The difference between these fields and those in need of organic matter is striking. The problem of supplying the soil with humus is becoming ever more acute. The farmers are becoming aware of it. They are facing other difficulties and are overcoming them.

GRINDSTONE LIES BURIED UNDER SNOW

STERLING W. EDWARDS

Up on the mountain above Grindstone Run the 3 children are riding their flexible flyers on a hard crust. We have 15″ of good snow melting only imperceptibly under 28 to 30 degrees in daytime. Oldest son and wife drove down from Boston thru a brown countryside to meet heavy snow 10 miles west of Baltimore. Schools closed unexpectedly some days before Christmas. Our people further back in the mountain, on the little dirt roads, were snowed in tightly. Butchering time is here and two of the most favored days are Thanksgiving and New Year's.

Clean Wheat. Some notes on the cleaning of wheat, rye and corn may prove helpful to those who have by now read enough in BD to be convinced that the home grinding of grains is important. This year, more than any in the past, the cleaning of our wheat and rye has been a real aggravation, a bad headache.

If we begin with local wheat and rye, it will be "green"; contain both small, large, shrivelled and broken berries; and be mixed with much foreign matter. In it, after it is sacked from either the thresher or combine (or the pile in the barrel if you do it by hand), will be small weed seeds; small pebbles; earth balls, depending on where the bundles were stored or shocked; cockle seed, wild onion, chaff; berries still in the husk; wheat heads, pieces of stalk; metal, at times, in various forms.

If, as some of our friends have done until better informed, you buy seed wheat from a seed house, you will get only the clean, bright, large berry; but this big berry will probably have been treated against insect damage, after it was stored in elevator or bin of large capacity. Even the local farmer may treat wheat stored on the farm, and, before planting, take it to a local feed house capable of giving it the mercury treatment. Take no chances on any of these wheats!

A home grinder in New York City gets grains directly from an elevator in Nebraska—a country of the best hard wheats from the finest wheat soils we have. These grains are treated; are not properly cleaned; and have been a constant source of irritation to her, in addition to heavy freight or express costs.

Search Out Grains You Can Count On. I can see no reason why most home grinders cannot make out with local grains. If you do not grow them, then seek a farmer who has B-D or organically raised wheat, rye, and corn, for 1st choice; or one who raises his crops naturally on manures, compost, or by other natural methods. Now cleaning this grain means freeing it of the above foreign matter, and so far as I can determine, it cannot be done fully in either a large flour mill or in a small fanning mill, without resort to some hand picking.

The larger roller mills, which replaced the smaller stone mills so abundant through our countryside 125 years ago, are not able to clean wheat for you, nor will they bother with a bushel or two. If you and others go together such a mill may be willing to run 10 bushels through. When we tried it recently, we found that our wheat was cleaned free of dust; a lot of small grains and chaff came out as screenings; but the main weight of wheat and foreign matter remained undisturbed, and the rye likewise.

Go Over The Back Issues B-D. For further information on home grinding and breadmaking, see *Bio-Dynamics*, Vol. 9, No. 3, p 6; Vol. 5, No. 2, p 14; Vol. 7, No. 1 and 2; Vol. 8, No. 2.

We Cleaned the Grain Once More. Some time later we ran it through a neighbor's small, motordriven fanning and screening mill. On this machine, the wheat is poured into a hopper which spreads a thin film of grain over a vibrating screen. This screen (made in proper hole size for each grain or seed) passes

the wheat but excludes large chaff, heads, large cockle, large onion, in fact anything larger or longer than a wheat berry. The through wheat falls on another screen of smaller holes which lets thru smaller seed, dust, dirt, etc., and the cleaned remainder on the screen then falls through an air stream which blows away *all* bodies *lighter* than a grain of wheat, and the force of this air stream can be regulated. The end product drops into a container below.

Thus in this device, much used on farms, if onion or cockle is heavier than wheat but of the same size, it cannot be removed. If you use too strong an air stream you can remove all light wheat, small and some large grains, as well, but the complete answer to a thorough cleaning of wheat does not lie in the performance of these mills, which cost less than $100.00. If one has use for screenings (waste from such a mill) and a well stocked granary, he can do a pretty good job, for his high percentage of screenings can be fed to chickens or stock. The home grinder who buys 3 bushels cannot, of course, afford the waste of 20 to 25% in screenings. One can buy cleaned wheat from many sources, but you then have no control over its past treatment, and hence it seems preferable to buy wheat from a known and original source, and watch the cleaning process yourself or do it at home.

We thus had our grains cleaned in both fan mill and roller mill and were forced to complete the job by hand cleaning at home on screens. For this purpose we made some dual purpose screens which serve as follows: 1. Place a teacup of grain on a 16 gauge screen and pick out the foreign matter, shaking from side to side to release small foreign mater; and, 2. after grinding this screen will eliminate approximately 16% of bran, thus making Graham flour. Such a screen is of galvanized screen wire on a wood frame, about 12″ x 24″.

Celery and Cabbage. We tried a straw-filled cabbage hole this year in the garden, and came to the conclusion that a buried barrel would probably be better and easier to get into. Cabbage kept well but there is too much waste on outside leaves. Celery in a long, boarded-up hill under leaves and fodder kept well also, and will give us grand stuff, unsprayed and untouched by chemicals, until spring.

Brooms. We plan a patch of broom corn next season. After harvest, we take old sticks and new corn to one of a half-dozen

broom-makers and will be charged 25c each on a per-dozen basis. (Thirty years ago the same item cost 10c.) Then we can have a good broom in every building.

•

Butchering Dinner. Today, New Year's 1952, we attended a butchering—all day job on two large hogs. Big butchering dinner served to all—those that worked, and those who stood around. All the heavyweights ate heartily of all the starches and fats—gravy to pie. Three of the heavyweights complain of distress after eating heartily of hogmeat at any time. Four admitted that the human race eats too much. A number felt they do not have enough green vegetables and fresh fruits in winter.

Spring is coming on. Every warm spell that melts a recent snow and every foggy rain which falls quietly on grass, brings a new spot of green here and yon, small islands in a sea of brown.

We pay tremendous sums in lip-service today to much that it tawdry, cheap and worthless. Only here and there are groups of individuals—some write in the *Christian Science Monitor*—who are able to note the forest thru the trees. We fall over tincups in praise of low entertainment, raucous rhythm and low comedy; we have the unceasing daily din devoted to extolling the virtues of tobacco, much manufactured food and similar trash which really have no virtue, and basically could be dismissed from our economy without loss. Some have given up reading altogether; they hope to get it off TV, while the coming generation spends a large portion of its leisure time and otherwise sitting entranced before this new medium, concerned chiefly with sports and murders.

Nevertheless, winter crawls slowly forward, while we get many things done indoors, one of which is shelling by hand 7 bushels of *Golden Queen,* an open-pollinated, yellow field corn and so store it away for the next two years' use in milk cans Raised on compost in rich land, not treated with any insecticides or poisons, this corn makes delicious muffins, corn bread and dog pone. We grind our own meal with its nutty flavor and rich taste, of course, far different from the tasteless, bolted stuff on the store counter. When you shell by hand you can pick out the poor grains. Commercial meal consists, usually, of all the grains, good and bad, and some cob as well.

THE ORGANIC WHOLE

A Book Review

FRED HECKEL

RANGE MANAGEMENT, Principles and Practices by Arthur W. Sampson, M. A., Ph.D., Professor of Forestry (Range Management), University of California. 570 pp. New York John Wiley & Sons, Inc. (Chapman & Hall Limited, London). $7.50.

Three and four decades ago there was only a relative handfull of scientists in the world struggling against the tendencies to over-specialization that sometimes cut off workers in related fields as effectively as the security requirements of modern warfare separate physicists in adjoining rooms from one another. In these relatively recent times there was still point to the joke that "a specialist is a man who learns more and more about less and less until finally he knows everything about nothing."

Dr. Sampson's most valuable book, published this February, would certainly not deprecate the services of the specialist. Even the irreverent book reviewer realizes that without the work of the man who focuses a lifetime on a small field of perspective, we would, today, be lacking much essential data. But it is at the same time unquestionable that science, both in its research and its application, needs to move still further toward integration, that the individual, studying "the trees" needs to spare a moment every now and then for a look at "the woods," lest he lose them. This has always been one of the underlying principles of the whole bio-dynamic approach to farm and fertilizer problems.

The very first two paragraphs of chapter one furnish a good picture of the breadth of the author's practical vision of his problems:

"Sound range management plays an important part in insuring the never-ending chain of human needs. The soil is the basic resource, producing forage that is converted by animals into products for human consumption. About one-third of all expenditures for food and clothing is for animal products—meat and milk, fats, leather, and wool.

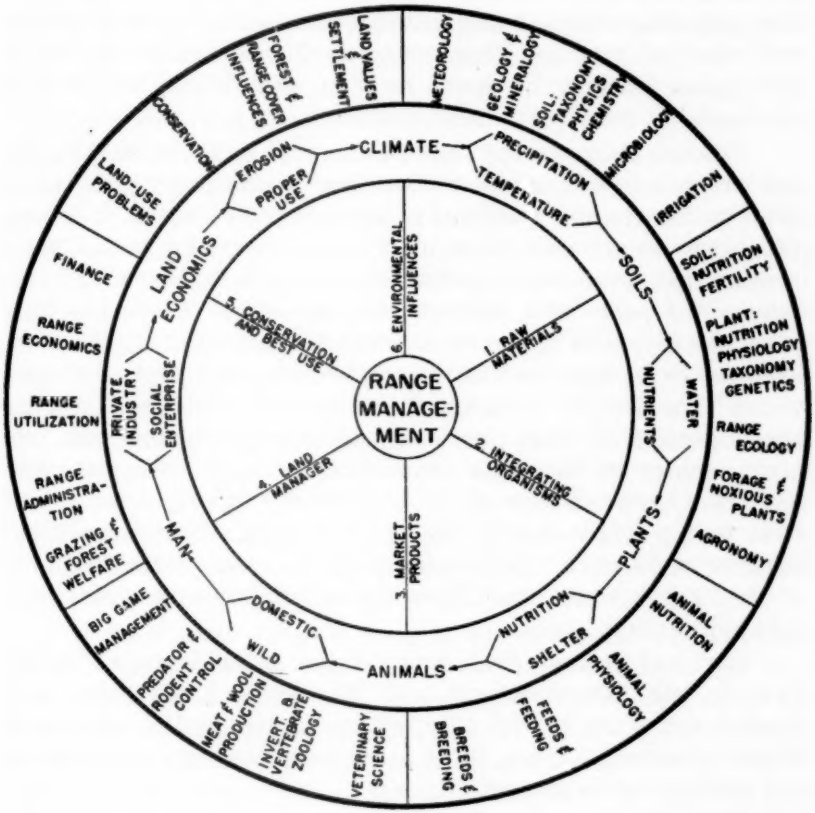
"The main links of this chain of human needs are soil development and maintenance, continuous production of desirable forage, and grazing by domestic animals and wildlife. The chain is disrupted when the topsoil is eroded away, as by unwise grazing practices."

The first of the many and varied illustrations in the book (which include 2 pages of color plates introduced to simplify the

identification of poisonous plants on the range) is a line drawing introduced by the author with the comment:

"If the range-management 'wheel' makes clear to the reader that many interwoven subjects enter into the solution of range problems, it will have accomplished its primary aim."

The cut is reproduced below, by kind permission of the publishers, John Wiley & Sons, Inc.



A schematic "wheel" design of range (pasture) management and its integrating organisms and disciplines. The range manager, like the ecologist, leans on many fields of basic and applied science as background material in drawing plans for rational grazing-land use.

Before we go any further, it should be stated that this is a most practical and useful book for anyone engaged in farming, anywhere, even though it is specifically directed at the problems of the rancher in the Western United States. One could not per-

haps, with a good conscience, advise the owner of two goats or a family cow to lay out $7.50 for it in these times. But even he, if he lives in a community where there are some more "extensive" farms, would be utterly justified in working on the nearest public library to get it on its shelves. The beautifully practical "key" method for amateur identification of pasture grasses and the entire treatment of just this subject alone would make it worth a lot to a lot of people. Then there is the graphic (with line drawings and simple words) presentation of the advantages of "deferred rotation" grazing. These principles, important on the Western range, reach right down, in their application, to the back yards and "borrowed" meadows of the home goat owners.

"Range Management" has 24 chapters in all, with the various subjects in each chapter conveniently listed—by their pages —under the chapter headings in the table of contents. It is easy to look up a particular point of information in this book. But it is more than a reference volume. It reads easily and always interrelates the parts of a subject with the whole. There are four main sub-divisions in the book: Part 1 is entitled "Range Management in Perspective." It introduces important basic concepts, views "The World's Grazing Practices and Problems," applies the principles of plant physiology to range problems, goes into plant ecology in the same connection, presents "Physical and Vegetal Characteristics of United States Grazing Lands" and ends with a lively chapter on "The Historical Development of Grazing in America." Here is included, in capsule form, the story of the "range wars" that form the foundation of so much current pulp fiction.

Part 2 of the book deals with "Native Range Forage Plants," Part 3 with "Improvement and Management of Range and Stock," and Part 4 with "Protection of Range Resources and Range Livestock." Here, there is included valuable material on soil erosion and its control.

The author's preface begins with the remark:

"This book has been a long time in the making." That is surely clear, even to the hurried reader. To attempt a "review" of the condensed essence of years of devoted work is in itself a kind of effrontery. Yet not to *tell* one's friends and readers a little *about* the book would be doing neither them nor the author a favor.

One cannot end this discussion without noting a few, random, points that resulted in notes by the reader. For instance,

the constant struggle between the forest conservationists, who want to see trees grow, and the cattlemen who howl that they need more use of the wooded federal ranges could be settled faster than a Korean armistice if all concerned stuck to the *common sense* embodied in a few basic sentences:

". . . Tree reproduction may be favored by grazing off the forage cover that might otherwise compete severely with tree seedlings. But excessive livestock browsing may be harmful to silvicultural practices where desirable, palatable seedlings and/or sprouts are destroyed. By working together, the range conservationist and the silviculturist can decide on the most satisfactory season and intensity of grazing least destructive to the forest and the pasturage.

"*Forest protection* deals with the detection, prevention, control and suppression of agencies injurious or destructive to the forest. It considers the control of insects, diseases, and fire in the forest, fire being the one most influenced by grazing practices. Grazing off inflammable vegetation is useful in checking the spread of fire and decreasing its intensity. However, in order not to injure timber reproduction, grazing must be conservative and done when the herbage is succulent."

With photographs, the author (as Pfeiffer did earlier in his "The Earth's Face and Human Destiny," an important volume hailed as such by Stapledon and his associates in England though still largely unrecognized here) points out what happens when, in times of national emergency, good grazing lands are ploughed up to make marginal wheat fields that end in being neither.

Of particular interest also, in his discussion of Seeds and Plant Propagation, is Professor Sampson's comment (p. 47): " . . . Controlled experiments of specific environmental needs are desirable at each phase of plant life. It is known, for example, that plants require different temperatures for specific periods of their development, such as germination, vegetal growth, and fruiting. Also, there is no temperature *optimum* for growth, as was formerly claimed, but rather an *optimal fluctuation* in temperature as the season advances." The italics are the author's.

In his discussion of some of the economic, physical and social aspects of ranching, the author leads into the problem of choosing a ranch with some comments which, if followed in principle by all those who plan to go into Bio-Dynamic Farming, would make the life of Dr. Pfeiffer and the other B. D. advisers a lot easier:

"The most important single factor is the man himself. His success will depend largely upon his business acumen and ability to adopt proven economic methods; upon his ambition, fondness for and knowledge of livestock; and upon his enthusiasm for ranch life.

"Purchasing a combination home and operating ranch entails much more careful judgment than buying a ranch purely as an investment. The decision to buy a ranch should not be based upon its physical features alone; the personal abilities, financial position, and preference for a particular kind of livestock, among other things, play a major role.

"Assume that a young man has the basic personal requirements and the desire to become a stockman, how can he learn to appraise and operate a ranch? The best and often the only way to acquire practical training is to hire out to a successful stockman. In this way the apprentice will learn improved and modern methods of land and livestock management. While serving his apprenticeship he should save his earnings, engage in all classes of work, and study the reason for doing a job the way it is being done.

"If opportunity affords, the potential stockman may supplement or intensify his training by attending an agricultural college; but no young man should expect to run a ranch successfully on a college education alone. Practical ranch experience will teach him how to do things."

NATURE IS SOMETIMES SLOW BUT SURE

When we read the numerous advertizements in our garden magazines and farm papers promising "sure death" to worms and beetles and "rapid easy control" of everything all in one package, a certain skepticism is apt to begin to grow up in our minds. Repetition of the same old story often seems to give rise to this. It is fun, once in awhile, to run across something different as we did recently in the *Wall Street Journal.* There we read about an insect which had been introduced more than 30 years ago to fight the European corn borer. All factors pointed to the fly, Lydella Stabulans Griesecens, being a howling success. Nothing much seemed to happen, however, until 1950 when it was discovered that the *forgotten* creature has quietly established itself and been eating away at the 300 million dollar-plus losses caused by the corn borer.

NOTES AND CORRESPONDENCE

SECOND CHRISTMAS AT ASSOCIATION HEADQUARTERS

Snow again! Cleaning paths and around the mail box, I saw the mail man coming. "You hit the jack pot today," he said, handing out a pile of letters.

"It's those post card bills sent out just before the rates went up at New Year," I replied.

"They sure pay up fast," he remarked; and I agreed, feeling pride and gratitude for the kind of folks you are.

And then I hurried back uphill, knowing that besides the welcome checks, many of these envelopes contained personal messages and interesting bits of news from old friends, as well as from many of you I've never met but feel as if I know. That was several days ago, and still the letters come each day—like a second Christmas mail. This is just to say "Thank you," to all of you who express so promptly your interest in and support of the Bio-Dynamic ideals.

If some of you reading this are not members of the Association but have sometimes thought about joining, you'll be interested in the following excerpts from recent letters.

California, Dec. 1951

Dear B-D:

Tsk-tsk! I've been a subscriber to Bio-Dynamics ever since it was published, practically. At least I have all the issues, plus a number of the English publications (before Bio-Dynamics), but no one has ever (even in the very nice personal letters I've had in answer to queries, etc.,) suggested that I become a member of the Association. Maybe I don't qualify, but if I do, I'd certainly like to 'belong.'

I'm enclosing a check for $6.00—if you can't apply it to a two year membership, will you please extend my subscription for four years. There is a catch, of short duration I hope, which is that my wife and I have just sold our home, and when we get packed and our furnishings stored, we intend to sally forth and find us a place to live and work (and, we hope, play) where we shall have some land around us—and where, if possible, we shall be closer to the 'old home town' and within the more mild climate of North-Central California.

What aids do you offer to 'members' (I hope) in their seeking for farm land? I recall some mention of soil-test service, etc.,

in the past, but don't know what you are able to do at the present time. I am very anxious to get hold of enough land to be able to raise much of our food (mainly for health reasons, *and* the satisfaction of producing better things than are generally available) plus enough to have some woods and some areas where we might experiment with soil building, with crops which might produce some cash income, etc. We are already great addicts of the growing of culinary herbs, and hope to expand into culinary seeds and spices which will grow where we live. If any offer a marketable produce, so much the better. The main thing is that we want to settle in an area which pleases us, that we have a place with what constitutes surrounding beauty in our eyes, and that we then choose the place with the best combination of land and buildings available to our limited purse. I want to be able to quit my traveling (which takes me now into four states) and find local work so that I can develop and enjoy the place we choose, and so that my wife and I can build our lives around a greater permanence (or the fiction thereof) than my present travel job permits.

But I'll need help in choosing and in building the soil, and I believe firmly in your methods (which I tried in a small way some years ago) and feel that by their use not only will our own health be improved, but that we shall have something to offer for money which will help expand our income. I should certainly appreciate having you send me any late information on the use of the B-D preparations, especially as applied to a new place, where such preparations may be obtained in the area north of San Francisco, and suggested reading matter.

A California Subscriber

Dear Mr. Subscriber,

I am still enjoying your good letter of mid-December. Of course, we will be delighted to have you as a member of the Association. I'm sorry if you have felt excluded all these years. We are so anxious to avoid any semblance of high pressure salesmanship that perhaps we lean too much the other way sometimes. Our idea is that no one is going to do anything with the Bio-Dynamic method unless they have enough interest to go ahead under their own steam. We are always ready to help, but we can't push. So we do no urging. However, we need a good many members who believe in the idea even though they can't do practical work. Enthusiasm and financial support are essential in addition to practical demonstration. So there is a place for

everyone. We certainly never mean to be exclusive. We welcome you most heartily and hope you stick by us as determinedly in your membership status as you have in support of the magazine.

It sounds as though you have quite an adventure ahead in choosing a new home, and one that won't be too easy if you are looking for good soil. It might interest you, while you are on the move, to see what Dr. Pfeiffer is doing with compost and soil improvement service in Oakland and Salinas areas. They are spraying B. D. material from low-flying airplanes in the truck growing regions and getting some striking results. I don't know addresses around Salinas but the Oakland address for the Compost Plant is Compost Corporation of America, 428-13th St., Oakland 12, Cal. From there you can doubtless find out more. Just now Dr. Pfeiffer is here in the laboratory but will be going west again before long. The soil testing would be essential in selecting your place. He made tests when he bought the Chester Farm eight years ago and since then has developed even better tests. They can be done in the laboratory by his assistants whether or not he is there. I will ask them to send you information on this.

Regarding herb growing, California is certainly a good place for this, but it is not an easy field in which to make money. The demand for quantity, in most cases, is not great, and the work involved is more than that for most crops. However, it is interesting, and certainly for your own use you will want to go ahead with it. Perhaps you may do more but I would not count heavily on it for cash. At present—with no war on there—herbs can be imported more cheaply from Europe than they can be grown here, as a rule. With Bio-Dynamic treatment you can, of course, get especially good results with herbs.

It seems that the main thing people want now is Bio-Dynamically grown food and there is very little of it for sale, although many folks raise their own. You might keep this in mind and if you find staple articles of food suitable to your purpose, plan on raising them. If you settle where shipping facilities to urban centers are easy, you might build up quite a business. Dr. Pfeiffer did that in Holland from his farms there before he came to this country: a direct producer to consumer service. The main thing is to begin slowly, don't attempt too much of a garden at the start until you learn what you and your situation can do.

As to B. D. preparations, they are made there on the West Coast and it is better to get them locally as far as possible. We

have a West Coast Branch of the Association which has occasional meetings (recently with Dr. Pfeiffer there to lecture) and membership in it is an additional 25c a year. All the officers of it have regular jobs and the time they can give to B. D. is not great, but they will be glad to help you insofar as they are able. Miss Bertha Sharpe, 1810½ N. Western Ave., Los Angeles 27, Cal., can let you know when they have get-togethers.

Best wishes in your home-seeking venture.

Very sincerely,

EVELYN SPEIDEN

TO HELP YOU CUT DOWN DELAYS

Incoming mail at Chester has been occasionally misdelivered in recent months, due to circumstances beyond our control. We frequently get mail not belonging to us and we know of a number of letters for us which have been delivered elsewhere or lost. Doubtless there are others of which we do not know. So if you have reason to think mail of yours may not have reached us, please try again.

Of course, it is quite possible, too, that a reply to your letter may be delayed because of the pressure of work in the office. This is regrettable even though we are all glad to see interest in and inquiries about the Bio-Dynamic method increase. So we hope that you will understand and help us out as best you can. Throughout the development of the Bio-Dynamic idea, it has always been the policy that an Information Center should be not just a clerical office but a place where Bio-Dynamic field practice is actually being carried out. That is, information, answers to questions, farm and garden advice, should come only from a center where experience is the basis, not just theory. This has great advantages, of course, but also drawbacks in that the answering of mail is only one of the many things to be done. Especially in view of the close connection of Bio-Dynamic work with seasonal changes, there are often "deadlines" for outdoor jobs.

The best way, for example, to get your prep orders when you want them, is to look ahead and say, "Please send them by the middle of the month," or "within three weeks." Disappointment is apt to follow a rush order, for mail exchanges are slower in the country. Also, the one who fills orders might be away for a day or two or in the midst of something else which must be completed first. True, you don't want preps lying around long be-

fore you are ready to use them, but we notice that as folks have more experience with Bio-Dynamic practice they can pretty well foresee when piles will be ready. We are all anxious to help you in every possible need, but there are limits to time and strength, even on good Bio-Dynamic food.

In Dr. Pfeiffer's office, too, the research work often competes with time for the office business. You can help us greatly by distinguishing between the Research office at Threefold Farm, Spring Valley and the Bio-Dynamic Association office at Chester, and sending mail accordingly. To Chester should go contributions for Research, Association dues, subscriptions to Bio-Dynamics, orders for literature (except books, which we do not carry. They should be ordered from Anthroposophic Press, 211 Madison Ave., New York City 16.) On the other hand, send to Biochemical Research Laboratory, Threefold Farm, payment for tests and other laboratory work done for you, also inquiries about and samples for such work. At present we have to remail a good deal of material—so much time out of creative work. So thank you for your efforts to understand this somewhat confusing situation, which was not planned, but "just grew" that way.

E. S. (Your Association Secretary).

COOKING WITH "GAS"?

That radioisotopes are proving to be valuable in many fields of science and our modern life of industry is common knowledge by now. Agricultural research uses them to check on the amounts of plant nutrients taken up by crops, industry uses them to measure microscopic tolerances, medical research employs them as tracers (to mention one of the most easily understood uses) and in many other more complicated ways. The *latest*, however, as far as the editors are concerned, is the use to which they have been put in research at the University of Michigan. The *Wall Street Journal* tells of this in the course of a long article by John A. McWethy on Nov. 1, 1951, describing the uses of "peaceable atoms." The research project at the university has to do with the preservation of food and Lloyd E. Brownell head of the project describes how meat and milk treated with radioactive cobalt kept more than three weeks without spoiling at a temperature of 77 degrees. The food is said to be just as nourishing as ever but it does taste as though it had been slightly burned. Maybe we ought to just let our taste buds atrophy after all.

CUTTING CORNERS IN GROWING CORN

Through the years we have discovered that corn (maize) is not only a true *native* of this part of the world but that it is almost more American than the population of the United States. Many of our friends from Middle Europe who have long since become citizens and Americans in the truest sense of the word just don't like corn bread, corn soup, or any of the dishes we revel in.

The nation as a whole seems to go on increasing its production and working against the diseases and pests and the soil erosion connected with this favorite food of ours. On December 15, 1951 the *New York Times* described a newly tried method for growing corn on worn-out land. The tests have been made under the direction of the American Farm Research Association and were reported on by Dr. George S. Scarseth, director of research.

These men have been worried about the 85 million acres of land which are used for growing corn; the way most of it is handled in regard to problems of erosion, the depletion of organic matter and so on they fear that the corn soils will eventually be destroyed. The first experiment tried on a farm in Indiana yielded 125.5 bushels to the acre in contrast to the 25 bushel yield from the same field the year before.

The method, using a combination of facts and factors gained from years of experiment and research, consists in essence of first, not plowing. Then only a narrow seedbed strip is prepared for the corn, two or three inches wide. The rest of the field is left as it was, with crop residue or dead weeds, whatever. A special machine was developed to plant the seed without plowing. At planting time 800 pounds per acre of a high analysis fertilizer was applied in a band nine inches deep under the seed row as well 300 more pounds per acre on either side in bands. The idea seems to be to fertilize the weeds. The corn was not touched for 4 weeks. The weeds were up to a man's waist but the corn seemed to be thriving. The weeds were knocked down with a special machine, two cultivations only were necessary. Early in July more nitrogen was applied, 200 pounds per acre of ammonium nitrate, 5 inches deep on one side of a row about a foot away.

This seems like an awful lot of fertilizer all in all. However, it is stated that about half of this value is carried over to

the next season in the organic matter residue from the corn stalks and the weeds. The knocked down weeds thus appear to have been used as a kind of mulch. Admittedly one season does not tell the whole story on any growth experiment. However Dr. Scarseth appears to feel that it may be possible with this method to grow corn year after year on the same fields without detriment to the soil.

BOOKS RECEIVED

The books listed below will probably be reviewed in the Summer issue. However, they seemed to the editors to have a certain timely significance with Spring underlining its imminence in these early days of March. The first robin has been sighted over a week ago, the air shifts hour by hour from the smell of snow to the gentleness of this briefest of our seasons.

PRINCIPLES OF WEED CONTROL

by Gilbert H. Ahlgren, Glenn C. Klingman, and Dale E. Wolf. 350 pp. John Wiley & Sons, Inc., New York (Chapman & Hall Limited, London). $5.50.

Here three experts (one in farm crops, one in agronomy, the third in industry related to agricultural biology) present the latest techniques, equipment, materials and facts relevant to this age-old agricultural problem.

ELEMENTS OF PLANT PROTECTION

by Louis L. Pyenson, Ph.D. Entomologist and plant pathologist Long Island Agricultural and Technical Institute. 501 pp. John Wiley & Sons, Inc., New York (Chapman & Hall Limited, London). $4.96.

This is one of a series brought out by the publishers under the listing of *Wiley Farm Series*. They are apparently meant as books of reference and information for students of agriculture, farmers, and for others who are related closely to some aspect or other of this far-reaching process. A casual leafing through leaves one mightily impressed by the wealth of material as well as the masterly manner in which it is organized.

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